

Abstract Submitted
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Dense High e+/e- Ratio Pair Creation using the Texas Petawatt Laser EDISON LIANG, ALEXANDER HENDERSON, WEN FU, TAYLOR CLARKE, Rice University, DEVIN TAYLOR, University of Wisconsin, WILLIE LO, PETR CHAGUINE, Rice University, HANNAH HASSON, Rice University and University of Texas at Austin, GILLIS DYER, KRISTINA SERRATTO, NATHAN RILEY, MICHAEL DONOVAN, TODD DITMIRE, University of Texas at Austin — We report results of pair creation experiments using ~ 100 Joule pulses of the Texas Petawatt Laser to irradiate solid gold and platinum targets, with intensities up to $1.9 \times 10^{21} \text{ W.cm}^{-2}$ and pulse durations as short as 130 fs. Positron to electron (e+/e-) ratios exceeding 15% were observed for many thick disks ($\geq 4\text{mm}$) and long narrow rod targets, with the highest observed e+/e- ratio approaching 50% for a Pt rod. The inferred pair yield was few $\times 10^{10}$ with emerging pair density reaching $10^{15}/\text{cc}$ so that the pair skin depth becomes $<$ pair jet transverse size, the minimum criterion for the pairs to become a “plasma.” These results represent important milestones towards the goal of creating a significant quantity of dense pair-dominated plasma with e+/e- approaching 100% and pair skin depth \ll pair plasma size, which will have wide-ranging applications to astrophysics, fundamental physics and innovative technologies. We will discuss some of these potential applications.

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